



# Eclipse Ballooning STEM Education Outreach for Elementary, Middle, and High School Education

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## Abstract

To promote Science, Technology, Engineering and Mathematics (STEM) education through ballooning, the North Dakota Space Grant Consortium (NDSGC) organizes an annual Near-Space Balloon Competition (NSBC) for students in grades 6 - 12. Students across the state of North Dakota have the opportunity to launch experiments into a near-space environment. The students learn how to write proposals, design payloads, and analyze data. They learn through an active, inquiry-based style that will prepare them for real-world engineering and critical thinking jobs. In 2016, NSBC proposed *Great American Eclipse* as the theme for the competition, thus the students were focused on designing heliocentric payloads.

To promote STEM education to students of all ages, North Dakota Atmospheric and Educational Student Initiated Research (ND-AESIR) partnered with third grade classes in a North Dakota tribal community for a balloon launch during the 2017 total solar eclipse. Students submitted ping-pong balls, which were filled with items of personal and cultural significance. The initiative allowed students to be involved in a space mission and educated them about space. ND-AESIR flew the ping-pong balls as a secondary payload during the total solar eclipse from Rexburg, Idaho. After the successful launch and retrieval of the payloads, the ping pong balls were returned to the students, who can now say that their treasured items have touched near space! These two outreach projects took advantage of the opportunity to focus on a rare astronomical event, providing a unique venue to inspire the students towards STEM involvement.

## Elementary School: Ping Pong Balls

- NDSGC and UND partnered with a third grade class in New Town, ND
  - 88 student participants
- Students placed items of personal or cultural significance into ping pong balls
  - Semester long outreach project: Spring 2017
  - Teachers taught solar and eclipse- themed science lessons
- Focus on how near space environment differs from Earth and affects or alters objects Earth objects
- Wide variety of payload elements, including flowers, stones, feathers, glass, plastic, seeds, etc

## NSBC

- Annual Near Space Ballooning Competition (NSBC)
- Middle and high school teams from across North Dakota
  - Year long project beginning in September 2016
  - Flight in April 2017
- Focus on intersection of science, technology, engineering, and mathematics as these disciplines apply to solar eclipse
- Payload experiment competition: heliophysical theme in preparation for eclipse
  - Full mission design and execution: proposals, payload fabrication, integration night, balloon flight, data analysis, and final reports
- Payload designs included UV photo reactive paper, solar powered battery chargers, effects of radiation on seeds and plant matter samples, NeuLog sensors, etca

## Local STEM Outreach

- NDSGC STEM Ambassadors
- Includes undergraduate and graduate volunteer student teachers
- Promote STEM education across all levels of education
- UND students as teachers
- Multiple outreach events throughout school year and summer
- Classroom visits with STEM experiments and discussions for primary and secondary students
- Eclipse, heliophysics, and human spaceflight applications theme for 2016- 2017 school year



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## Conclusions

STEM Education continues to be a major component of the NDSGC mission. Events like the 2017 Total Solar Eclipse have proven to help get young students involved in STEM activities, and it motivates them to pursue STEM throughout their education and career. The NSBC has also shown to be an excellent platform for students to get hands-on experience. The North Dakota Space Grant Consortium has received positive results because of high student involvement and a broad spectrum of outreach.

